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Abstract

The recognition that information is, most of the time, incomplete and imperfect is essential in understanding the nature of the formation of beliefs. To understand human behavior in the area of (academic) performance, the beliefs individuals sustain about their ability become crucial. Before performing a certain task, the agent never knows his/her true ability. He/she only has an *ex-ante* notion of his/her believed ability and the truth is only revealed *ex-post.* Once the true ability is known and the payoffs realized, we observe different reactions that range from disappointment to happiness. The logical question is then, who would have preferred not to know the truth? This paper deals with the information acquisition decisions of individuals who face uncertainty about their own ability. At a theoretical level (Bénabou and Tirole, 2002), it has been shown that overconfident individuals (people with beliefs about themselves higher than reality) with time inconsistent preferences have more at stake when they face the decision of learning the truth about themselves than more pessimistic agents. To test this prediction, a field experiment is designed and implemented, where students face the decision of learning, or not, their true ability before performing a test. It will be shown that overconfident students indeed more often decide not to learn their true ability.

Contents

1.1 Introduction

Is information always valuable for the decision making process, as it is in classical decision theory? This question is easily answered when the decision makers are fully rational individuals maximizing a *well-behaved* utility function with uncertain inputs. Information about the unknown is indeed always valuable in this setting. However, when individuals exhibit time inconsistent behavior (for example, hyperbolic preferences) with incomplete and imperfect information, access to information can damage more than help during the decision making process for certain types of people. This heterogeneity amongst individuals is related to how close/far are their beliefs about states of the world, which are relevant for their utility functions, from the truth. If the relevant state of the world for the decision making is the ability of the individual, when his believed ability is above his *true* ability, we observe overconfidence. Bénabou and Tirole (2002) emphasizes the theoretical detrimental effect of information about true ability when performing a task for overconfident individuals with time inconsistent preferences. In this paper, I design and implement a *field*[1] experiment to test this hypothesis in order to provide supporting empirical evidence.

This paper builds on three hypotheses. First, most of the information about fundamentals in the real world is unknown or partially known. Information is not perfect or complete. Second, individuals have beliefs about these fundamentals which are relevant to their decision making process. Therefore, decisions are made based on beliefs when accurate information is not available. Third, in a variety of situations individuals exhibit time inconsistent preferences. Bénabou and Tirole (2002) provides a theoretical model showing that overconfident people (i.e. people whose beliefs are 'better' than the truth) prefer not to get information about their true ability when they have the option to decide. The key crucial assumptions for this prediction are the time inconsistent nature of human beings and the recognition of heterogeneity across individuals in their believed confidence. The authors model the self-control problem of an individual with hyperbolic preferences that has to decide whether or not to learn his true ability before performing a task. Utility depends directly on ability. They provide theoretical support for the trade-off between *the risk of*

[1] I used the word "field" to emphasis the experiment was applied to students in standard Universities, not to a social laboratory using volunteers. However, the key element of field experiments is not present in the setting here, i.e. the introduction of exogenous variation.

overconfidence (engaging on a project when you are not capable enough to succeed) and *the self-confidence maintenance* (abandoning the project even though *a priori* you are capable enough to succeed). When the self-confidence maintenance motive is big enough the individual prefers not to know his true ability. This happens only for overconfident individuals. Information, then, is not always valued as it is in classical decision theory. On the other hand if the person is under-confident (accurate), information is always valuable (neutral). Moreover, if the assumption of time inconsistent preferences is ignored, the heterogeneity on believed confidence is irrelevant and information is always valuable.

The contribution of this paper is the design and implementation of a *field* experiment in the area of education to test the predictions of the Self Control model by Bénabou and Tirole (2002). The sample consists of students from standard taught courses at undergraduate or postgraduate level. The structure of the course has to have (at least) one test accounting for X% of the final score and a (1-X)% final exam. The official information rule and common knowledge is that the result of the test(s) is not revealed until the final exam has been taken. The experimental setup is the following: immediately after the X% test, students are given the option to decide if they want to privately learn the score they got in test X% immediately before (minutes) the final exam (or the next test). Given the student knows how much he studied and the difficulty of the X% test they just performed, I assume that the score is a good private signal to proxy for ability. According to the Bénabou and Tirole model, we would expect overconfident students to decide more often not to learn the result of the preceding test. A general questionnaire is applied to all the students of the class during the term. The most important measures to classify the students by their degree of overconfidence will be extracted here. Also, individual characteristics like age, gender and degree of risk aversion are collected.

In practice, to finally provide the feedback to the students according to their stated preferences was not possible because of Institutional rules. Immediately after the test corresponding to the X% of the final degree, the professors did communicate that the result of the test could not be revealed until the next test (or final exam). Therefore, the students had the option to decide on the information structure in advance. Students were asked to answer a small questionnaire in which they had to state whether or not they wanted to privately learn the result of the actual test immediately before the next test. With this information, and as the setting required, the professor would then reveal the scores accordingly. In the next lecture, the professor apologized and communicated that the rules of the Institution with respect to the partial scores had to be applied (in general, students have the right to learn their scores weeks in advance the next test, for pedagogical reasons). Therefore, at the end the rules of the Institution were not modified, but the students stated their preference for knowing or not their *true ability* believing they had the option to decide, exactly the behavior I wanted to catch.

The experiment was applied to 282 undergraduate students during the Spring term 2009 (September-December) in Santiago, Chile. They came from compulsory courses in **Chemistry (1st year), Statistics** and **Economics (4th year)** in the Engineering Faculty of the University of Chile; and compulsory **Micro-** and **Macroeconomics** courses (2nd and 3rd year) at *Universidad Diego Portale*s. The result supports the prediction that the decision of learning the true ability is decreasing in the degree of overconfidence: the more overconfident, the less the students were likely to want to learn their previous score before the next test.

Information on overconfidence and other characteristics was also collected for 473 additional students, corresponding to five parallel Chemistry classes in the Engineering Faculty of the University of Chile, Spring term 2009. Score records for most of these classes, in addition to the classes in the experiment, were also available. The scores students obtain in their respective classes are a mix of ability and effort, which are impossible to disentangle under this setting. Therefore, to look for the causal effect of overconfidence on performance would give spurious results. In any case, the result of no correlation between performance and overconfidence is interesting.

This paper is organized as follows. Section 1.2 discusses the literature relevant for the present research. Section 1.3 develops the model from Bénabou and Tirole (2002), adding the analysis for different degrees of risk aversion. Section 1.4 presents the experiment design and the details of the implementation. Section 1.5 describes the data collected and some important sample statistics. Section 1.6 presents the main results and Section 1.7 concludes.

1.2. Literature Review

The empirical question analyzed in this paper relies on three fundamental pillars of decision making analysis in modern economics.

The first is the recognition that human behavior does depart from the *homos economicus* standard. The interrelation between psychology and economics has been widely developed during the last decades. The predictions coming from fully rational individuals and well-behaved preferences have been challenged by an increasing number of authors. Behavioral economics amends the assumption of fully rational agents and takes seriously the malleability of human beliefs. Gleaser (2004) states that "the promise of economics and psychology is that the tools of economics can predict the extent that beliefs and preferences are manipulated in the market".

Beliefs are relevant for decision making because information is imperfect and incomplete most of the time. The information acquisition process to update beliefs has exogenous and endogenous components. Individuals are supposed to deal optimally with the information they have access to, costly or not. This is the second key element of the present research framework: the information acquisition process under uncertainty is essential for the utility maximization process.

There are many examples from psychology supporting the idea that individuals indeed manipulate at their convenience (or *believed* convenience) the information to update beliefs about personal characteristics. Thus, Bénabou and Tirole (2001) puts together observational findings in psychology to better understand their main economic implications. The paper is able to give formal content to individuals' traits such as self-confidence, intrinsic motivation, dependence/autonomy and power of will, as well as to cognitive processes such as wishful thinking or selective memory, self monitoring and the setting of personal rules. It departs from the typical rational economic agent allowing for imperfect self-knowledge, imperfect willpower and imperfect recall. Specifically, imperfect self-knowledge refers to the uncertainty that people face about their own abilities and even preferences, which could exert some behavioral bias toward instant gratification. Imperfect willpower reflects the fact that people do not always act in their best interest, therefore selfdestructive behavior and also time inconsistent preferences are allowed. Finally, imperfect recall takes into account that memory is imperfect, attention is limited and awareness can therefore only be selected. At the same time, Bénabou and Tirole (2001) maintains the classical approach with the intertemporal utility maximization problem the individual has to solve when choosing an action, i.e., the agent tries to do what is best for himself given his current (often inaccurate) perception of his own interests and abilities. The skepticism with respect to the messages of others and one's own memories or rationalizations is represented by Bayes' rule. It is under this framework that self-confidence emerges as a valuable asset in the decision making process.

Bénabou and Tirole (2002) derives important implications on how agents process information and make decisions. It highlights the importance of self-confidence for the individual decision making process via three channels: *consumption value* in the sense that self-image is included simply as another argument of the utility function; *signaling value* because if you really think you are "good" (or a "high type" in the typical task-effort agent problem) you can more easily convince others of this; *and motivation value* in the sense that self-confidence improves individuals' motivation to undertake projects and persevere in the pursuit of their goals, in spite of the setbacks and temptations that periodically test their willpower. The authors emphasize this last channel because of its substantially broader explanatory power. More particularly, the motivation value channel yields an endogenous value of self-confidence that responds to the situations and incentives the individual faces, in a way that can account for both "can-do" optimistic beliefs about themselves and others, and "defensive" pessimism.

There is evidence of heterogeneity across individuals' beliefs on a variety of topics. Bénabou and Tirole (2006) develops a theoretical framework to explain why most people need to believe in a just world (*you get what you deserve, effort pays,* etc.). The paper argues that differences in the valuation of these beliefs across countries and their prevalence could explain important international divergences in aggregate macroeconomic variables. I would like to emphasize this *need* to believe which, implicitly, makes reference to a characteristic of human beings that is going to be the third pillar of this research.

It has been observed that individuals are sometimes willing to sustain false (or inaccurate) beliefs about themselves, even though accurate information is available. Gleaser (2004) claims that, given the psychological evidence of malleability of human perceptions and emotional states, decisions are made based on local influences more than on long-run wellbeing. He discusses an economic model of false beliefs and the implications for their prevalence, where beliefs are the result of external and internal influences. In the present research we are interested in the beliefs that individuals sustain about their perceived ability and how they deal with the available information to update these beliefs, to become closer (or not) to the truth. Bénabou and Tirole (2002) provides a theoretical model showing that overconfident people (i.e. people with beliefs about themselves above the truth) prefer not to get information about their true ability when they have the option to decide. The third pillar of the present research is the recognition of heterogeneity across individuals in their believed confidence with respect to the truth. Therefore, the time inconsistent nature of human beings under uncertainty and their different degree of overconfidence imply different responses in the information acquisition problem. The model that forms the basis of the experimental setting, the Self Control Problem, is developed in detail in the next section.

Confidence can be understood in terms of the feeling of certainty about a state of reality. The strength of this feeling is what it is known as confidence (Pulford, 1996). Self-confidence refers to how certain we are about our own ability in different situations. In this context, overconfidence appears when your predicted ability is higher than in reality. One of the manifestations of overconfidence, relevant for this study, is *miscalibration*[2].

At the empirical level, research in psychology has focused on how to properly measure overconfidence (West and Stanovich, 1997; Pulford, 1996; Klayman et al, 1999; among others). The main conclusions are that on average people have a tendency towards overconfidence, that there is a lot of heterogeneity in confidence across individuals, that overconfidence increases with the difficulty of the task and that there is apparent domain specificity in confidence judgments.

[2] The other most common manifestations of overconfidence relevant to economics are known as the "better than average" effect and the "illusion of control" (Deaves, Lüders and Luo, 2009).

Empirical research in economics has mainly studied the impact of overconfidence on economic outcomes. The main result is that overconfidence does matter. For example, based on a controlled asset experiment, Deaves, Lüders and Luo (2009) provides evidence of additional trade gathered by overconfidence. Biais, Hilton, Mazurier and Pouget (2002) provides evidence supporting the idea that overconfident traders are expected to suffer particularly from the winner´s curse, as they tend to overestimate the precision of their signals. In fact, these traders are found to earn relatively low trading profit.

In a different context, closer to the one analyzed in the present study, Bandiera et al (2005) introduces the idea of overconfidence in an attempt to evaluate the impact of feedback on academic performance. This paper distinguishes theoretically between overconfident and underconfident students, showing the ambiguous *a priori* effect of feedback on effort (and then, in final performance) depending on the prevalence of the *motivation effect* versus *slacker effect*. They find robust evidence that feedback (about past performance) has an effect higher or equal to zero on final performance (or final score in taught postgraduate courses) over the whole distribution of ability. Therefore, under the feedback regime both underconfident and overconfident student should theoretically exert more effort that with no feedback. However, the paper does not have measures of students' overconfidence to check this result empirically. Even though the purpose of the paper is not to know which regime these different types of individuals would prefer if they had the option to decide, it is interesting to think about the different *a priori* theoretical answers to the question, given the degree of overconfidence.

In the area of behavioral finance, Guiso and Japelli (2006) empirically studies the information acquisition effect on portfolio performance. For rational investors, information is always beneficial and improves portfolio performance. However, for overconfident individuals, information could be detrimental. The introduction of overconfidence here accounts for investors systematically overestimating the value of the private signals. For this reason, they spent too much money and time acquiring information which leads to inefficient portfolio allocations. The time spent looking for financial information is shown to be negatively correlated with portfolio performance, supporting the hypothesis of overconfident investors. This effect is stronger for investors "suspected to be" more overconfident. There exists two main differences with my own research. First, the authors do not have a measure of overconfidence for each individual so they cannot properly measure the effect of overconfidence on information acquisition. They empirically observe a detrimental effect of information on portfolio performance which is consistent with the overconfidence hypothesis. Then, looking at variables that are supposed to be more frequently associated to overconfident investors, they conclude that the detrimental effect of information on portfolio performance is stronger the more overconfident the investor. Second, the variable for information is *time spent acquiring financial information*. They do not refer to the quality of information; they only state that whatever the quality of information, an overconfident investor tends to overstate its veracity. The investor does not have the option to know how far his believed signal is from the truth, which would be the equivalence with my research.

To my knowledge there is no empirical research analyzing the information acquisition decision about personal characteristics for individuals with different degrees of overconfidence. This study tries to take a first step in filling this gap.

1.3. The Model

The basic model is developed by Bénabou and Tirole (2002), which provides theoretical support for the tradeoff between *the risk of overconfidence* (engaging in a project when you are not capable enough to succeed) and *the self-confidence maintenance* (abandoning the project even though, *a priori*, individuals are capable enough to succeed). This trade off becomes relevant when individuals are given the option to learn accurate information about their ability before performing a task where the associated utility depends directly on ability. When the self-confidence maintenance motive is strong enough, then the individual would prefer not to know his true ability. Overconfident people (individuals with believed ability higher than the truth) have more at stake when the true ability is revealed and therefore more often prefer not to learn their true ability. Additional to the theoretical conclusions of Bénabou and Tirole, I analyze the role of risk aversion given confidence. The value of information is declining in risk aversion: risk averse individuals would more often prefer not to know the truth.

<u>Basic setting</u>

Bénabou and Tirole (2002) analyzes a game that consists of three periods. In the first period (t=0) an agent has to decide the information structure about his ability at t=1 (θ=ability or probability of succeeding in a task when trying $\in [0,1]$). He decides between learning θ for sure or learning nothing than he did not know at t=0 (i.e. $F_1(\theta)=F_0(\theta)$ where $F_t(\theta)$ is the cumulative distribution ability function at date t). At t=1 the agent decides whether to undertake a project (or exert effort in a project). He is imperfectly informed about the probability of succeeding in a task when trying or, equivalently, about his ability θ. In the last period (t=2) information is revealed and payments realized.

The payments associated with each period are given by:

$u_0 = 0$ The decision of the information structure for the next period is costless.

$u_1 = \begin{cases} -c & \text{if taking a project and exerting effort} \\ 0 & \text{if not} \end{cases}$

$u_2 = \begin{cases} \theta V & \text{if succeeding} \\ 0 & \text{if not} \end{cases}$

where *c>0* is the cost of effort (constant for simplicity), θ is the probability of succeeding if trying (or the <u>ability</u> of the individual), with Cumulative Distribution Function (CDF) $F_t(\theta)$, and *V>0* a constant. Note that there are complementarities between effort and ability: the higher one's ability in the activity, the stronger the incentive to undertake the project.

The player is a risk neutral student[3] and a collection of his incarnations per period of time. I call *Self-t* a student incarnation in time t. The individuals are utility maximizing agents with hyperbolic utility functions, to account for the salience of the present. Therefore, from the point of view of each Self, the intertemporal utilities/payoffs are given by:

$$U_0(\theta) = E_0\left(u_0 + \beta\delta u_1 + \beta\delta^2 u_2\right) = \beta\delta\left[-c + \delta\overline{\theta_0}V\right]$$
$$U_1(\theta) = E_1(u_1 + \beta\delta u_2) = -c + \beta\delta\overline{\theta_1}V$$
$$U_2(\theta) = u_2 = \theta V$$

$0 < \beta < 1$ reflects the momentary salience of the present and $0 < \delta < 1$ is a standard discount factor.

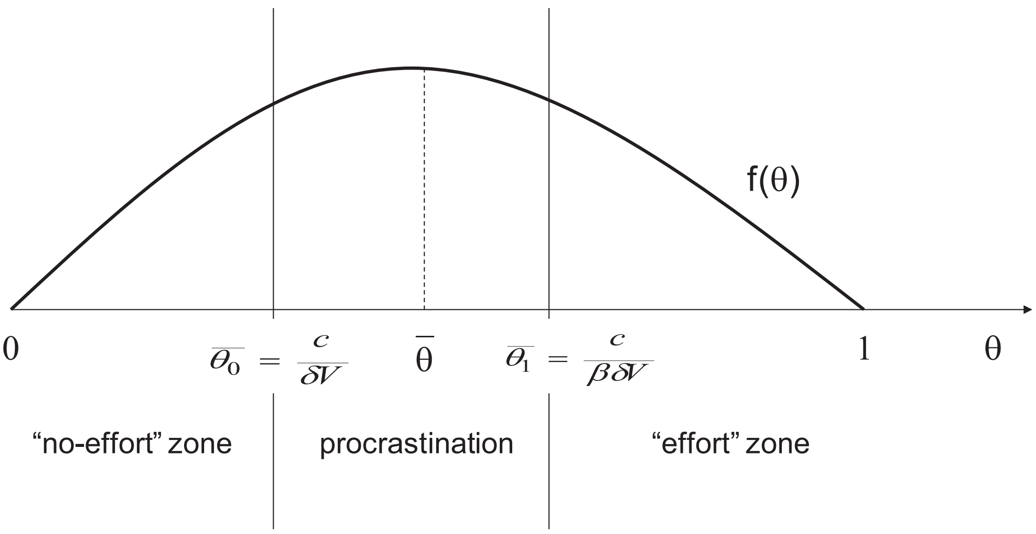
Solving the problem from the point of view of Self-0, the individual only undertakes the project if his belief about his expected ability is higher than a certain threshold, i.e. $E_0[\,\theta] \equiv \overline{\theta_0} \geq \frac{c}{\delta V}$

[3] The role of risk aversion is analysed later in this section.

Solving the problem from the point of view of Self-1, the individual only undertakes the project if his belief about his expected ability is bigger than a certain threshold, with outcomes higher than the one solving Self-0 problem, i.e. $E_1[\theta] \equiv \overline{\theta_1} \geq \frac{c}{\beta\delta V}$.

Therefore, due to the time inconsistency of the game, there is a zone in the domain of ability where even though Self-0 was willing to exert effort (or undertake the project), when time passes Self-1 finds it optimal to procrastinate. Figure 1.1 shows this schematically.

Figure 1.1: The Self-Control Problem



Included in the diagram is a hypothetical distribution function of ability that generates an expected belief of ability equal to $\bar{\theta}$. In this case, the individual at time t=0 decides to exert effort but, at t=1 he procrastinates given that, from Self-1's point of view, it is no longer optimal to undertake the project. If the expected ability $\bar{\theta}$ would have been in the "effort" zone, the individual always exerts effort given that, for that value of ability, it is always optimal to undertake the project. Similarly, if the expected ability $\bar{\theta}$ would have been in the "no-effort" zone, the individual never exerts effort as for that value of ability it is always optimal not to undertake the project.

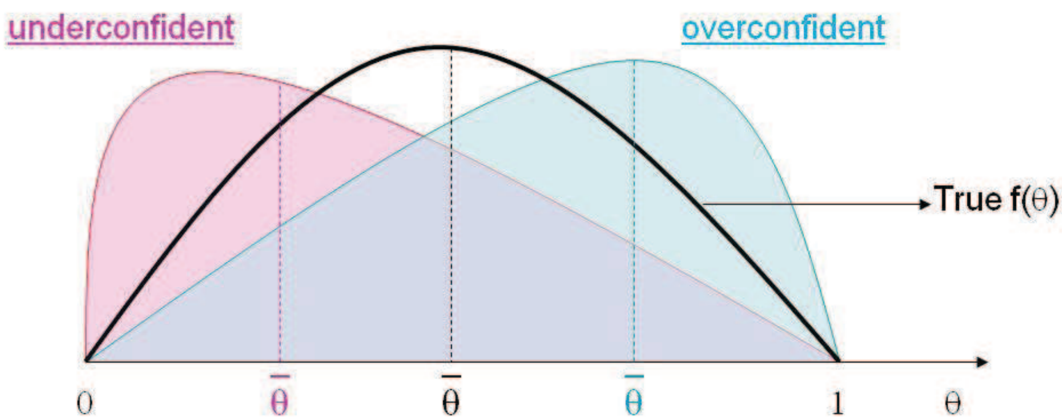
The value of Information

Remember that we are interested in the information acquisition decision at t=0, i.e. we want to know *what kind* of individuals are more willing to decide to learn their true ability before undertaking the project. As such, we introduce the concept of overconfidence, underconfidence and accuracy.

Confidence can be understood in terms of the feeling of certainty about a state of reality. The strength of this feeling is what it is known as confidence (Pulford, 1996). Self-confidence refers to how certain we are about our own ability in different situations.

In this context, overconfidence appears when you think your predicted ability is higher than it truly is in reality. Following the same logic, underconfidence appears when your expectation is below the truth (Figure 1.2). A well calibrated or accurate person would be the individual holding a belief about his ability similar to the truth.

Figure 1.2: Overconfidence, Accuracy and Underconfidence.



Notice that you *never know the truth* in the setting for the information acquisition decision. The only information you have are your beliefs about θ or, more specifically, the expected value of ability given your beliefs: $\bar{\theta} = \int_0^1 \theta dF(\theta)$.

Now we focus attention on the problem of an overconfident individual in the context of the game under analysis. Assume that the individual has beliefs about ability above $\frac{c}{\beta\delta V}$ while the truth is below. The individual thus thinks he is inside the “effort” zone. Therefore, without information, it is always optimal to exert effort. The value of information for this individual will be given by:

$$I_F(overconfidence) = \beta\delta\left[\int_0^{\frac{c}{\delta V}}(c-\delta V\theta)dF(\theta) - \int_{\frac{c}{\delta V}}^{\frac{c}{\beta\delta V}}(\delta V\theta - c)dF(\theta)\right] \equiv \beta\delta[G_F - L_F]$$

The first term (G_F) contains the gain from being informed. If the true ability of the individual is below $\frac{c}{\delta V}$ but he does not know this, he inappropriately perseveres in the project and G_F accounts for the gain of correcting his behavior at date 1. The second term (L_F) represents the loss from being informed, which may depress the individual's self-confidence: if he learns that θ is inside the procrastination zone, he will procrastinate at date 1 even though, *ex ante*, it was optimal to exert effort. Information is therefore detrimental to the extent that it creates a risk that the individual will fall into the time inconsistency region. If this *confidence maintenance motive* is strong enough ($L_F > G_F$), the individual will prefer to remain uninformed[4]. Therefore, overconfident people would be more frequently in this situation.

Notice that when the individual is underconfident, i.e. with beliefs below $\frac{c}{\beta\delta V}$ but true ability above, information is always valuable. Self-1 will always exert (weakly) less effort than Self-0 would have wanted to. Therefore, information can only help the individual to restore his deficient motivation.

$$I_F(underconfident) = \beta\delta\int_{\frac{c}{\beta\delta V}}^{1}(\delta V\theta - c)dF(\theta) > 0$$

[4] “In the absence of time inconsistency (β=1) we have $L_F > 0$ and thus $I_F \geq 0$: in classical decision theory, information is always valuable” (Bénabou and Tirole, 2002).

The role of risk aversion

The qualitative characteristics of the model are maintained when analyzing separately individuals with different degrees of risk aversion: the time inconsistency creates a zone were the maintenance of personal motivation makes overconfident people prefer not to know their true ability when performing a task.

However, given the beliefs about θ for a given individual, we want to know how risk aversion affects the information acquisition decision.

To understand this more easily, I analytically solved the game above for a risk averse, risk neutral and risk loving individual whose ability (or probability of success when trying) $\theta \sim \mathrm{U}(0,1)$ have a uniform distribution. The payments associated to period 2 (given effort) differ over risk aversion as follow:

Risk averse	Risk neutral	Risk lover
$u_2 = \sqrt{\theta}V$	$u_2 = \theta V$	$u_2 = \theta^2 V$

Solving the problem, the new thresholds obtained for each degree of risk aversion are:

Self-0 point of view	Self-1 point of view
$\overline{\theta_0}(risk\ averse) \geq \left(\frac{c}{\delta V}\right)^2$	$\overline{\theta_1}(risk\ averse) \geq \left(\frac{c}{\beta\delta V}\right)^2$
$\overline{\theta_0}(risk\ neutral) \geq \frac{c}{\delta V}$	$\overline{\theta_1}(risk\ neutral) \geq \frac{c}{\beta\delta V}$
$\overline{\theta_0}(risk\ lover) \geq \sqrt{\frac{c}{\delta V}}$	$\overline{\theta_1}(risk\ lover) \geq \sqrt{\frac{c}{\beta\delta V}}$

As $0 < \frac{c}{\delta V} < 1$, the following order applies:

$$\overline{\theta}_t(risk\ averse) < \overline{\theta}_t(risk\ neutral) < \overline{\theta}_t(risk\ lover)\ \forall\ t = 0,1$$

The intuition behind this is that risk loving agents have a marginal utility of commitment lower than risk neutral and risk averse individuals. Therefore, effort is only exerted for very high values of believed θ. On the other hand, more risk averse individuals are equally happy with much less utility, therefore they commit to effort for lower values of θ. Overall, risk loving individuals would decide to undertake the project less often than less averse agents for a given distribution of ability. Remember there is not disutility for not engaging in the project. Therefore the risky decision here is "not to do it".

The value of information across risk aversion

Solving the information acquisition decision problem analytically for the three different degrees of risk aversion, we found that information is more valuable, given confidence, for risk loving agents.

Risk averse		Risk neutral		Risk lover
$I_F = \frac{c^3}{(\beta\delta V)^2}\left(1 - \frac{2}{3\beta}\right)$	$<$	$I_F = \frac{c^2}{\beta\delta V}\left(1 - \frac{1}{2\beta}\right)$	$<$	$I_F = \frac{c^{3/2}}{(\beta\delta V)^{1/2}}\left(1 - \frac{1}{3\beta}\right)$

Given the individual is exerting effort, i.e. his belief about his ability is above his respective threshold at date 1, a risk loving agent is more willing to learn if he is making an incorrect choice of undertaking the project. His gain from being informed (G_F) is thus much bigger than for risk neutral and averse individuals. Moreover, the loss from being informed (L_F), or the *confidence maintenance motive,* is higher for risk averse people, making the overall value of information even higher for risk lovers.

Summarizing, the model predicts that overconfident agents would more often prefer not to learn their true ability. Besides, given overconfidence, the value of information is declining in risk aversion: risk averse individuals would more often prefer not to know the truth.

1.4. Experiment design

The sample consists of students from a standard taught course at undergraduate or postgraduate level. The structure of the course has to have (at least) one test accounting for X% of the final score and a (1-X)% final exam. The official information rule and common knowledge is that the result of the test(s) is not revealed until the final exam has been taken. The experimental setup is the following: immediately after the X% test, students are given the option to decide if they want to privately learn the score they got in X% test immediately before (minutes) the final exam (test (1-X)%). Given the student knows how much he studied and the difficulty of the X% test they just performed, I assume that the score is a good private signal proxy of his ability. According to the Bénabou and Tirole model, we would expect overconfident students to decide more often not to learn the result of the preceding test.

A general questionnaire will be applied to all the students of the class during the term. The most important measures to classify the students by their degree of overconfidence will be extracted here. Extra questionnaires measuring overconfidence are applied as robustness checks. Also, individual characteristics like age, gender and degree of risk aversion are collected.

In practice, to finally provide the feedback to the students according to their stated preferences was not possible because of Institutional rules. Immediately after the test corresponding to the X% of the final degree, the professors did communicate that the result of the test would not be revealed until the next test (or final exam). Therefore, the students had the option to decide in advance the information structure. Students were asked to answer a small questionnaire were they had to state whether or not they wanted to learn privately the result of the actual test immediately before the next test. With this information, and as the setting required, the professor would reveal the scores accordingly. The students would not have the option of learning the scores weeks in advance of the time of the next test, which prevented strategic behavior when deciding whether to learn their ability. Therefore, the decision only takes into account the theoretical channels exposed in section 1.3. In the next lecture, the professor apologized and communicated that the rules of the Institution with respect to the partial scores had to be applied (in general, students have the right to learn their scores weeks in advance the next test, for pedagogical reasons). Therefore, at the end the rules of the Institution were not modified, but the students stated their preference for knowing or not their *true ability* believing they had the option to decide, exactly the behavior I wanted to catch.

1.5. Data

Data collection

The data collected in this experiment are (1) *true score (proxy for ability)*, (2) binary *observed final decision* about learning or not the true ability parameter, (3) independent measure of “calibration-based”, “better than average” and “more accurate” overconfidence, (4) risk aversion and (5) general characteristics. The partial and final grades are also available and will be used to control for “general quality of the student” for robustness checks. Notice, however, the information is useless to analyze the effect of information on performance because effort is not observed.

I claim that the score students get in the tests is a proxy for *ability*. It is true that students will *contaminate* this measure of ability because they will study (or exert effort) to better perform. But they privately know if they studied or not and also the difficulty of the test already performed, therefore they would be able to privately extract a proxy of ability if they get information about the result.

The final decision is labeled 1 if the student decides to see the results of the previous tests immediately before the next test (or final exam) and 0 otherwise.

The General Questionnaire has three parts to measure (3), (4) and (5). The independent measure of calibrated-based overconfidence (CBO) and better-than-average (BTA) follows Deaves et al (2009). The measure more-accurate (MA) is ad-hoc. To get the CBO, general knowledge questions are provided where the student has to state, with 90% certainty, an interval for his answer. Overconfidence is then the proportion of questions for which the true answer falls outside the stated range. This method is known as *confidence-range judgments* in psychology and it is a better alternative than *two-choice questions judgments* that are said to be a fertile ground for bias information gathering (Klayman et al, 2000). CBO is exactly the kind of overconfidence measure we are interested in, because it compares the individual beliefs relative to himself. The measure of BTA is based on the answer to the question “Of the *N* (yourself included) students in this class, how many do you think will end up having a higher score than you in the test?” The measure of BTA corresponds to the deviation of the difference between the class' size *N* and the number the student gives, from the average size of the class. MA is 1 if the student answers YES to the question: "Do you think your answers to the *knowledge questionnaire* were more accurate than those of your classmates?" These last two overconfidence measures compare the individual with the rest of the class. It gives a *relative-to-others* measure of overconfidence that should not be relevant for the information acquisition decision analyzed here, because the tests in the sample are graded using absolute scale. If the scale were relative (to the average, to the best grade, etc.), BTA and MA instead of CBO should drive the information acquisition decision (see Appendix 1.1 for the general questionnaire applied).

The measure for risk aversion is constructed using the answer to the following question: "We would like to ask you a hypothetical question that you should answer as if the situation were a real one. You are offered the opportunity of acquiring an asset permitting you, with the same probability, either to gain half million Chilean pesos (1000 US$ approx.) or to lose all the capital invested. What is the most that you would be prepared to pay for this asset?" Following Guiso and Paella (2005), we are able to classify people among risk averse, risk neutral and risk lovers.

Finally, individual characteristics (age and gender) are also collected.

The measure of overconfidence is crucial for the identification in this empirical research. Attempting to avoid (or at least diminish) measurement problems, students were encouraged to honestly answer the questionnaires. The official lecturer of each class was the one explaining the rules and asking the students to do their best at answering the questionnaires, also communicating the intention of using the information being collected for academic research purposes. The high competitiveness of students in the sample (historically known in the Engineering Faculty as well as among students in Economics), it also should help in the direction of diminishing measurement problems: most of the students answered the questionnaires and the rate of explicit answers for all the questions was very high. As robust check to prevent measurement problems for overconfidence, a second questionnaire was applied to the classes under study.

The Sample

The experiment was applied to 282 undergraduate students during the Spring term 2009 (September-December) in Santiago, Chile. Table 1.1 describes basic statistics (see appendix 1.2 for detailed statistics by gender). The courses **Chemistry**, **Economics** and **Statistics** are compulsory courses in the Engineering Faculty of the University of Chile. Chemistry corresponds to first year and Economics and Statistics to the fourth year. This explains the difference in average age. **Micro** and **Macro** are compulsory courses of the career Economics in Universidad Diego Portales, second and third year. The Engineering Faculty historically has had a majority of men, which is reflected in the higher proportion with respect to the other courses. The students over the whole sample are extremely risk averse: only 5 people of over 266 students that answered the risk aversion question reported to be risk neutral and there were no risk lovers. Around 45% of the sample reported to be willing to pay less than ten thousand Chilean pesos (equivalent to 2% of the lottery prize). Figure 1.3 shows kernel density estimation for the overall absolute risk aversion index.

Table 1.1: Sample summary statistics

Course		age (years)	gender (male=1)	absolute risk aversion (risk averse>0)	CBO (overconfident>0)	BTA (better than avg>0)	more accurate (yes=1)	know (want to know=1)
Chemistry	mean	18.8	0.81	0.36	0.39	0.04	0.20	0.46
	std.dev.	*1.04*	*0.40*	*0.07*	*0.24*	*0.21*	*0.40*	*0.50*
	N	59	58	55	55	55	55	57
Statistics	mean	22.0	0.71	0.32	0.53	0.08	0.30	0.49
	std.dev.	*1.02*	*0.46*	*0.11*	*0.23*	*0.20*	*0.46*	*0.50*
	N	65	65	62	65	64	64	65
Macro	mean	21.2	0.64	0.37	0.52	0.19	0.31	0.70
	std.dev.	*2.61*	*0.49*	*0.08*	*0.24*	*0.18*	*0.47*	*0.47*
	N	36	36	33	33	31	32	33
Micro	mean	19.3	0.53	0.39	0.38	0.07	0.23	0.74
	std.dev.	*1.12*	*0.50*	*0.04*	*0.25*	*0.33*	*0.43*	*0.44*
	N	43	43	37	37	31	31	43
Economics	mean	21.1	0.80	0.33	0.51	0.17	0.42	0.96
	std.dev.	*0.88*	*0.40*	*0.09*	*0.22*	*0.18*	*0.50*	*0.20*
	N	79	79	79	79	78	78	75
Total	mean	20.6	0.72	0.35	0.47	0.11	0.31	0.68
	std.dev.	*1.79*	*0.45*	*0.09*	*0.24*	*0.22*	*0.46*	*0.47*
	N	282	281	266	269	259	260	273

The measures of overconfidence are positive across courses, in line with the international evidence. Overconfidence is measured for additional students (528 students in parallel classes of Chemistry, University of Chile; 22 PhD researchers in Economics, course in Econometrics, European University Institute). Figure 1.4 presents kernel densities for the CBO measures across courses. All of them are located towards positive values with similar variance. Table 1.2 shows a mean comparison across samples. It seems that the international evidence supporting high degrees of overconfidence is confirmed: the students in the sample sustain overestimated beliefs about their precision. It is also interesting to note the higher overconfidence levels among men compared to women in most of the samples.

Table 1.2: CBO International Comparison

Mean comparison	**CHILE**						**EUI**	Deaves et all (2009)	Klayman et al (1999)	Biais et al (2004)
Sample	Chemistry (528 students)	Statistics (65 students)	Macro (33 students)	Micro (37 students)	Economics (63 students)	Total Chile (726 studens)	Applied Econometrics (22 PhD students)	64 finance and economic students, Konstantz and McMaster Universitites.	32 students University of Chicago	245 stundets Toulose Unversity and London Business School
CBO	0.49	0.53	0.52	0.39	0.51	0.49	0.473	0.68	0.47	0.460
female	0.48	0.50	0.48	0.40	0.56	0.48	0.450	0.70		0.440
men	0.50	0.54	0.54	0.38	0.50	0.49	0.480	0.67		0.470

The measures BTA (better than average) and MA (more accurate) show positive average values, i.e. individuals have a tendency to think about themselves as better than their peers. The probability of believing the student answered the questionnaire more accurately than his classmates increases by 80% with BTA[5]. These two variables capture the same relative-to-others effect. If we compare CBO with BTA and MA, even though all of them show positive average overconfidence, we observe the coefficient of correlation between CBO and BTA is 0.08, i.e. almost no correlation! The theory behind this paper does not make any prediction about how measures of confidence relative to your peers would affect your information acquisition decisions. As previously mentioned, the absolute grading system in the sample makes CBO the relevant measure of overconfidence for the information acquisition decision. Even though we have no prediction for the estimates

[5] This number was obtained estimating a *probit* model where the dependant binary variable is MA (=1 if more accurate) and the independent variables are BTA, gender, age and risk aversion. The marginal effect of BTA and gender are 0.8 and 0.3, respectively, both statistically significant different from zero at 1% confidence. The coefficients for age and risk aversion are not statistically significant different from zero.

using BTA and MA, we do guess that the impact on the decision of getting information about your ability should be different when the grading scale is relative-to-others. Therefore, in the present study, the relevant effect to capture is the effect of CBO on the information acquisition decision; BTA and MA should have no effect.

Figure 1.3: Kernel Density, Absolute Risk Aversion.

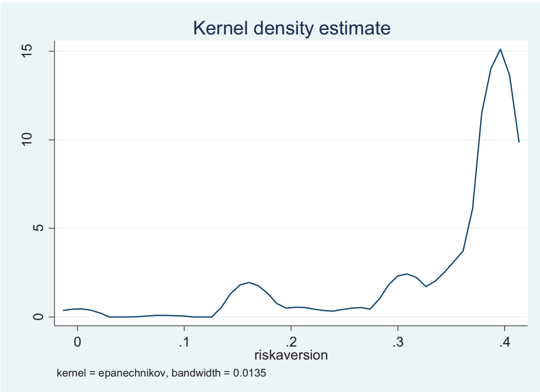
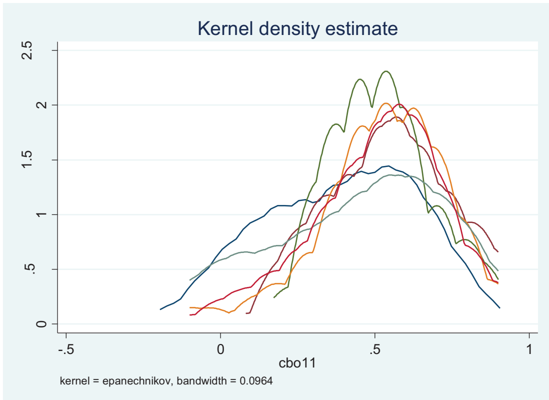


Figure 1.4: Kernel Density, Calibrated Based Overconfidence (CBO)



The variable "know" is 1 when the students answered affirmatively to learn the result of previous test before performing the next one. There is an important difference between the results from the first two courses in Table 1.1 (Chemistry and Statistics) and the last three (Micro, Macro and Economics). The last group has a very high proportion of students preferring to know compared to the first group (80% versus 47%, respectively). The reason is the following. The experiment in Chemistry and Statistics was applied in the second test out of three. After the third test, they had to perform a final exam. The students were told that the scores of test 2 would not be revealed until test 3 had been taken. Therefore, students that declared to prefer to know the results of test 2 immediately before sitting test 3 are the ones summarized here, corresponding to 46% and 49% of the classes. This is exactly the information acquisition decision the experiment attempts to capture. The experiments in Micro, Macro and Economics were applied to the second test out of two. After the second test, the students had to perform a final exam. The students were asked if they wanted to know the results of test 2 immediately before the final exam. However, the rules of the respective Institutions established that students with presentation-to-the-exam average score above a certain threshold would be exempt of sitting the exam. The questionnaire in Macro and Micro explicitly said that preferring to learn the results after the exam would also avoid knowing if the student was in the exempt category. Therefore, a bias towards “to know” is observed that would make spurious the estimation of the effect of overconfidence on information acquisition decision for this sample. In the case of Economics, the alternative given to the students was a bit different: they had to decide if learning the result of test 2 (a) after the final exam or (b) two weeks in advance the sitting date of the final exam. In this case the information about the score would also affect their allocation of effort (or time to study) for the final exam. We observe, accordingly, 96% of the students preferring to know. It is interesting to notice, in any case, that the 4% preferring *not to know* is far to the right on the distribution of overconfidence (CBO of the students varying across 0.6 and 0.9, where 0 < CBO < 1 means overconfidence).

Therefore, even though the data for *Micro, Macro & Economics* is still informative, caution has to be introduced when analyzing the results. The sample for *Chemistry & Statistics* is the most reliable and discussed in the next section.

1.6. Results

The hypothesis tested and confirmed is: “overconfident students decide more frequently not to get the information about their true ability”.

Table 1.3 summarizes the OLS (robust standard errors) estimation of the dependant variable *know* (=1 if students prefers to know) on overconfidence CBO, gender and additional characteristics.

Table 1.3: Information Acquisition OLS regressions (Overconfidence)

Dependant var.	All Sample				Statistics & Chemestry				Micro, Macro & Economics			
know=1	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
CBO	-0.151	-0.159	-0.158	-0.232	**-0.333**	**-0.346**	**-0.365**	**-0.366**	-0.071	-0.071	-0.072	-0.115
(Overconfidence)	(1.29)	(1.36)	(1.35)	(2.13)**	(1.80)*	(1.86)*	(1.96)*	(1.92)*	(0.58)	(0.57)	(0.59)	(0.95)
Gender	-0.1	-0.101	-0.118	-0.103	-0.212	-0.203	-0.236	-0.203	0.026	0.027	0.029	-0.023
(male=1)	(1.60)	(1.61)	(1.88)*	(1.71)*	(2.02)**	(1.88)*	(2.26)**	(1.91)*	(0.38)	(0.38)	(0.42)	(0.35)
Age		0.011				0.01				0		
		(0.75)				(0.40)				(0.03)		
Absolute Risk			-0.35				**-0.830**				0.058	
Aversion			(1.10)				(1.85)*				(0.13)	
Macro				0.196								
				(1.89)*								
Micro				0.198								0.032
				(1.96)*								(0.29)
Chemistry				-0.045				-0.054				
				(0.48)				(0.56)				
Economics				0.472								0.27
				(7.12)***								(2.95)***
Constant	0.825	0.604	0.965	0.688	0.797	0.6	1.118	0.83	0.864	0.872	0.842	0.767
	(11.94)***	(1.98)**	(7.09)***	(7.82)***	(6.94)***	(1.14)	(5.57)***	(6.59)***	(11.18)***	(3.09)***	(4.65)***	(7.56)***
Observations	254	254	251	254	116	116	113	116	138	138	138	138
R-squared	0.02	0.02	0.02	0.21	0.07	0.07	0.09	0.07	0	0	0	0.12

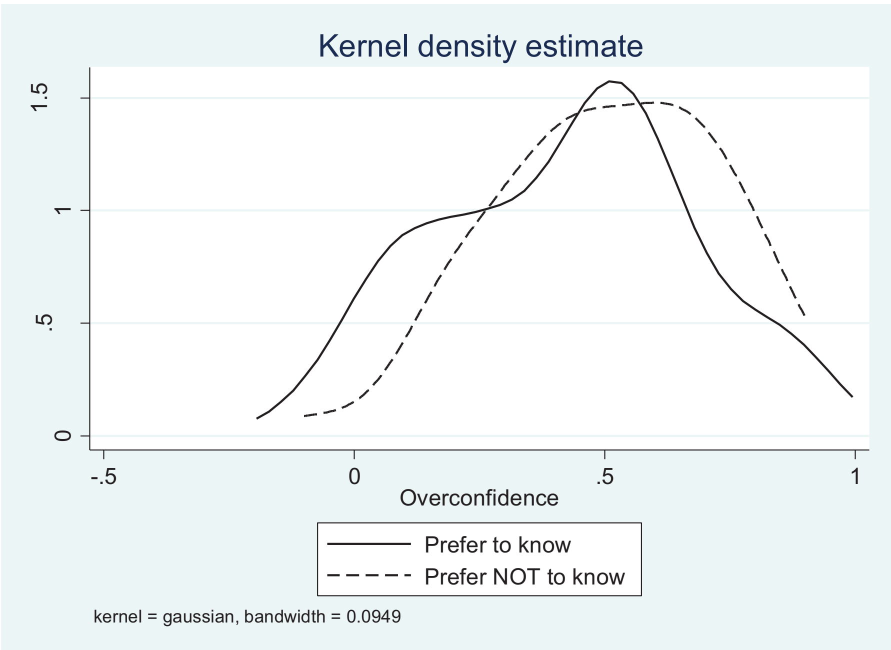
Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

The first sets of estimations are performed over the whole sample. The estimated impact of overconfidence is negative as theory predicts. However, it only becomes statistically significance in the last specification, when fixed class effects are included. The latter makes sense because we control for the bias towards “prefer to know” as discussed in section 1.5 for the courses Micro, Macro and Economics. The positively bias effect is captured in the dummies for each class and, as it can be seen, it was indeed what was making spurious the estimated coefficient of CBO. Gender (equals 1 for male, 0 for female) has a negative statistically significant effect for the last two estimations for the whole sample: men are on average less willing to get feedback about ability. Separate regressions for the samples *Statistics & Chemistry* and *Micro, Macro & Economics* are then run.

All the specifications for the sample of *Statistics & Chemistry* courses show the negative and statistically significant effect of overconfidence on the information acquisition decision. The estimated coefficient is robust to all the specifications. Gender (male=1) is again negative and statistically significant. The estimated coefficient for risk aversion, in line with the theory discussed in section 1.3, is also negative and statistically significant: the more risk averse the student, the less willing he is to learn his true ability.

It is also interesting to notice that the estimated overconfidence distribution function for people that preferred “not to know” seems to be more concentrated to the right compared to the distribution function for people preferring to know their true ability. The latter confirms the theory discussed in section 1.3. Kernel estimations for the sample of Statistics & Chemistry are shown in figure 1.5. The similarity with the theoretical distributions shown in figure 1.2 is revealing.

Figure 1.5: Kernel Density, Calibrated Based Overconfidence (CBO).



In the case of the estimations for *Micro, Macro & Economics*, even though the estimated coefficients for overconfidence are negative across specifications, they are not statistically different from zero, as anticipated. The confounding effect collected in the variable *know* for this sample, relative to the exemption from the final exam if the presentation score is higher than a threshold, makes spurious the interpretation of the estimated coefficient for the effect of overconfidence on the information acquisition decision. In other words, the score of the test is not only revealing the true ability to the student. It also reveals information about the possibility of passing the class and avoiding the final exam. Finally, the gender effect is not statistically different from zero for this sample.

Table 1.4 shows the equivalent regressions of table 1.3 but now controlling also for *ability* (the score they effectively got in the test they decided to know or not). The idea behind this is that ability should not be informative given that the students did not know the grade before taking the decision. However, for the last sample *Macro & Economics*[6], given the extra information contained in the score, we expect to capture the confounding effect to get a clean estimated coefficient for overconfidence[7]. As can be seen, the estimated coefficient for *ability* is indeed positive and statistically significant, capturing the anticipated biased trough *prefers to know*. The cleaner estimated coefficients for overconfidence are negative as theory predicts and, even though the t-statistics are higher than before, they do not become significantly different from zero.

Table 1.4: Information Acquisition OLS regressions, quality control (CBO)

Dependant var.	All Sample				Statistics & Chemestry				Macro & Economics			
know=1	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
CBO	-0.178	-0.192	-0.19	-0.277	**-0.304**	**-0.314**	**-0.344**	**-0.331**	-0.169	-0.166	-0.171	-0.164
(Overconfidence)	(1.36)	(1.47)	(1.45)	(2.32)**	(1.64)	(1.68)*	(1.84)*	(1.72)*	(1.25)	(1.22)	(1.25)	(1.28)
Gender	-0.163	-0.16	-0.19	-0.179	-0.21	-0.204	-0.235	-0.203	-0.081	-0.084	-0.079	-0.118
(male=1)	(2.44)**	(2.40)**	(2.83)***	(2.81)***	(2.03)**	(1.89)*	(2.26)**	(1.92)*	(1.47)	(1.48)	(1.35)	(1.76)*
Ability	0.002	0.006	0.006	-0.019	-0.056	-0.054	-0.044	-0.054	0.088	0.089	0.088	0.044
	(0.06)	(0.19)	(0.20)	(0.66)	(1.34)	(1.29)	(1.03)	(1.27)	(2.89)***	(2.87)***	(2.88)***	(1.48)
Age		0.023				0.007				0.005		
		(1.49)				(0.27)				(0.44)		
Absolute Risk			-0.506				-0.79				0.045	
Aversion			(1.57)				(1.75)*				(0.12)	
Macro				0.19								
				(1.80)*								
Chemistry				-0.041				(0.04)				
				(0.44)				(0.43)				
Economics				0.482								0.241
				(7.07)***								(2.56)**
Constant	0.874	0.389	1.056	0.85	1.037	0.897	1.297	1.054	0.63	0.515	0.613	0.684
	(5.65)***	(1.05)	(5.22)***	(5.65)***	(5.22)***	(1.53)	(4.96)***	(5.26)***	(3.75)***	(1.59)	(2.62)**	(4.33)***
Observations	219	219	216	219	116	116	113	116	103	103	103	103
R-squared	0.03	0.04	0.04	0.26	0.08	0.08	0.10	0.08	0.11	0.11	0.11	0.2

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

[6] The grades for the Micro class are not available for administrative reasons.

[7] Extra measures accounting for "quality of the student" were also used (*final degree* and presentation-*to-the-exam score*). The results are qualitative and quantitative similar to those discussed here using *ability*.

Table 1.5: Information Acquisition OLS regressions (Better Than Average)

Dependant var. know=1	All Sample				Statistics & Chemestry				Micro, Macro & Economics			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
BTA	0.347	0.351	0.356	0.145	0.276	0.276	0.293	0.279	-0.05	-0.042	-0.05	-0.017
(better than averag	(2.41)**	(2.41)**	(2.47)**	(1.08)	(1.23)	(1.23)	(1.30)	(1.24)	(0.35)	(0.28)	(0.35)	(0.12)
Gender	-0.12	-0.121	-0.138	-0.12	-0.228	-0.228	-0.245	-0.229	0.045	0.04	0.048	-0.016
(male=1)	(1.88)*	(1.89)*	(2.15)**	(1.95)*	(2.20)**	(2.14)**	(2.34)**	(2.19)**	(0.63)	(0.53)	(0.64)	(0.24)
Age		0.015				0.001				0.006		
		(0.98)				(0.02)				(0.48)		
Absolute Risk			-0.357				-0.760				0.057	
Aversion			(1.06)				(1.72)*				(0.12)	
Macro				0.181								
				(1.68)*								
Micro				0.192								0.016
				(1.78)*								(0.13)
Chemistry				-0.01				0.008				
				(0.10)				(0.09)				
Economics				0.456								0.256
				(6.69)***								(2.65)***
Constant	0.729	0.427	0.866	0.573	0.643	0.632	0.917	0.64	0.83	0.709	0.808	0.718
	(13.54)***	(1.36)	(6.62)***	(7.65)***	(7.21)***	(1.21)	(5.41)***	(6.69)***	(13.38)***	(2.71)***	(4.58)***	(7.64)***
Observations	244	244	241	244	115	115	112	115	129	129	129	129
R-squared	0.03	0.04	0.04	0.20	0.05	0.05	0.07	0.05	0.00	0.00	0.00	0.12

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.6: Information Acquisition OLS regressions (More than Accurate)

Dependant var. know=1	All Sample				Statistics & Chemestry				Micro, Macro & Economics			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
More accurate	0.062	0.058	0.057	-0.007	0.015	0.014	0.000	0.014	-0.009	-0.009	-0.008	-0.027
(equals 1 if yes)	(0.92)	(0.87)	(0.85)	(0.12)	(0.14)	(0.12)	(0.00)	(0.12)	(0.13)	(0.13)	(0.12)	(0.44)
Gender	-0.126	-0.126	-0.14	-0.114	-0.229	-0.228	-0.239	-0.228	0.034	0.031	0.037	-0.017
(male=1)	(1.91)*	(1.90)*	(2.10)**	(1.78)*	(2.11)**	(2.01)**	(2.17)**	(2.06)**	(0.47)	(0.42)	(0.49)	(0.25)
Age		0.011				0.002				0.004		
		(0.75)				(0.07)				(0.30)		
Absolute Risk			-0.341				-0.764				0.077	
Aversion			(1.05)				(1.76)*				(0.17)	
Macro				0.176								
				(1.67)*								
Micro				0.199								0.04
				(1.85)*								(0.34)
Chemistry				-0.019				-0.005				
				(0.20)				(0.05)				
Economics				0.469								0.285
				(6.94)***								(3.02)***
Constant	0.749	0.524	0.881	0.582	0.655	0.617	0.928	0.656	0.826	0.75	0.796	0.699
	(14.28)***	(1.71)*	(6.99)***	(7.76)***	(7.31)***	(1.15)	(5.53)***	(6.88)***	(13.34)***	(2.86)***	(4.58)***	(7.84)***
Observations	245	245	242	245	115	115	112	115	130	130	130	130
R-squared	0.01	0.02	0.02	0.20	0.04	0.04	0.06	0.04	0.00	0.00	0.00	0.13

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Finally, tables 1.5 and 1.6 summarize the results for the estimations using the measures of "overconfidence" BTA and MA instead of CBO. The results confirm the problem of these two variables in properly capturing *absolute overconfidence (or with respect to the individual himself)*. The similarity in the estimations is remarkable (i.e. BTA and MA seem to capture the same kind of variation for the sample): gender (male=1) has a negative and statistically significant impact on the decision of learning the true ability except for the last sample (last four columns). The effect of BTA and MA is not statistically different from zero for almost all the specifications and samples. For the separate regressions on the sample *Statistics and Chemistry* the coefficients are also not statistically different from zero and gender and risk aversion impact negatively the information acquisition decision with 5% and 10% interval confidence, respectively.

If the decision about getting the information about true ability depends on things other than the believed value of self-esteem in the utility function, then the results could suffer from omitted variables. The experiment here isolates individuals from external motivation. There is no intervention of external agents *forcing* students to get the information (social pressure: “everybody did it”; dictator: father very authoritarian; peer effects: “all my friends did it”). If self-reputation matters in the decision making process, the signal you send about your ability to your future self will matter in today´s utility function. In this setting, true ability will be revealed sooner or later (i.e. the scores will be revealed at the end of the academic year in any case). Therefore, whatever the student type, self reputation should not be an issue when deciding whether to learn the true ability (it is just a matter of timing before the information is revealed). However, we cannot isolate individuals from external shocks that make them temporarily (or even permanently!) indifferent to everything, and therefore also to the decision of learning the true ability (the girlfriend just broke up with him; relative just had an accident, etc.). These shocks are expected to be random and captured in the error term.

To check possible measurement error in the levels of overconfidence and other measured variables, a second questionnaire was applied to the courses Chemistry, Macro and Micro (see appendix 1.3). Even though beliefs could exhibit some dynamic over time, the short time between the application of questionnaires should allow us to capture the same, or very similar, degree of overconfidence for the same individual. The correlation coefficients between the values obtained for CBO are indeed significant and positive (0.50 and 0.46) for Chemistry and Micro. Also the correlation between the values obtained for BTA are positive (0.54 and 0.46) and significant for the same courses. In the case of Macro, the results show no correlation to weaken the reliability of the measures for that specific sample.

Information on overconfidence and other characteristics was also collected for 473 additional students, corresponding to five parallels Chemistry classes in the Engineering Faculty of the University of Chile, spring term 2009. Score records for most of these classes, in addition to the classes in the experiment, were also available. The scores students get in their respective classes are a mix of ability and effort, impossible to disentangle under this setting. Therefore, to look for the causal effect of overconfidence on performance would lead to spurious results. It is, in any case, interesting to note that there is no correlation between performance and overconfidence. The correlation coefficients between the CBO and the final score (the weighted sum of partial tests and final exam) for the 458 students in the final sample is statistically significant equal to 0.1. The correlation coefficients between the CBO and the presentation score (average of partial tests) is statistically significant and equal to 0.08.

Summarizing, the empirical results support the hypothesis that overconfident students decide more often not to learn their true ability. This evidence shows that information does not always seem to be valuable, as is assumed in classical decision theory.

1.7. Conclusions

Behavioral economic theory for the problem of information acquisition decisions under uncertainty predicts that overconfident people with time inconsistent preferences would prefer more often not to get accurate information about their true ability, or the relevant uncertain fundamentals in their utility function. Based on the theoretical model of Bénabou and Tirole (2002), a field experiment in the area of education was designed and implemented to test this hypothesis.

The experiment was applied to 282 undergraduate students during the spring term 2009 in Santiago, Chile. The results confirm that the decision of learning the true ability depends negatively on the degree of overconfidence: the more overconfident the individual, the less frequently he prefers to know his true ability. The estimated distribution of overconfidence for individuals preferring not to know is to the right of individuals preferring to know, consistent with the theory discussed in section 1.3.

Information on overconfidence and other characteristics was also collected for 473 additional students, corresponding to five parallel chemistry classes in the Engineering Faculty of the University of Chile, Spring term 2009. Score records for most of these classes, in addition to the classes in the experiment, were also available. No correlation was found between final performance and overconfidence.

The main contribution of the paper is the design and implementation of the field experiment. Notice that it is not properly a field experiment in the classical sense because the experimenter does not introduce external random variation in the setting. The beauty of the setting relies on the simplicity: with no intervention in the formal structure of the courses that participated in this experience, we are able to collect the relevant information to test the overconfidence hypothesis. The setting can be easily applied and even adapted to many other environments where personal control problem matters.

The heterogeneity in overconfidence of human beings matters for the information acquisition decision. Further research should be done to understand the effect of this heterogeneity on other important areas of economics where information matters for decision making.

Appendix 1.1: General Questionnaire.

This information will be used only for research purposes and under total confidentiality (neither the professor nor the teacher assistant will have access to it).

<u>Please try to answer as honestly as you can.</u>

ID number (or name if you do not remember): ___________________________

Age: __________ years

We would like to ask you a hypothetical question that you should answer as if the situation were a real one. You are offered the opportunity of acquiring an asset permitting you, with the same probability, either to gain 500 thousands Chilean pesos (approximately US$1000) or to lose all the capital invested. What is the most that you would be prepared to pay for this asset?

___________________ Chilean pesos.

How many cigarettes do you smoke in a typical week, including the weekend?

_____________________ cigarettes.

We would like to assess your general knowledge, and how well you know how much you know. For the following series of questions with clear-cut numerical answers, please provide 90% confidence intervals. Such an interval has a lower an upper bound such that you are 90% sure the correct answer lies in this interval. Note that if your intervals are too wide, the correct answer will fall in your interval more than 90% of the time, while, if you intervals are too narrow, the correct answer will fall in your intervals less than 90% of the time.

Question	Lower bound	Upper bound
World population growth between 1975 and 2005 (in percentage terms)		
Year in which Newton discovered universal gravitation		
Number of Nations in the OPEC (Organization of the Petroleum Exporting Countries)		
Number of overall medals that Greece won at the first Olympic Summer Games in 1896		
Year in which Bell patented the telephone		
Percentage of total area in world covered by water		
Height of Sears Tower in Chicago (in meters)		
Number of nations in NATO (North Atlantic Treaty Organization)		
Age of sun in billions (10^9) of years		
Number of bones in an average adult human skeleton		

Do you think that your answers were more accurate than your colleagues in the Questionnaire you just answered? (Answer YES or NOT)

____

Of the 56 (yourself included) students in this class, how many do you think will end up having a higher score than you in test you just performed?

____

Appendix 1.2: Sample Summary Statistics by Gender.

Female

Course		age (years)	gender (male=1)	absolute risk aversion (risk averse>0)	CBO (overconfident>0)	BTA (better than avg>0)	more accurate (yes=1)	know (want to know=1)
Chemistry	mean	19.0	0.00	0.38	0.28	-0.06	0.00	0.55
	std.dev.	*0.77*	*0.00*	*0.02*	*0.30*	*0.20*	*0.00*	*0.52*
	N	11	11	10	10	10	10	11
Statistics	mean	22.3	0.00	0.34	0.50	0.10	0.05	0.68
	std.dev.	*1.33*	*0.00*	*0.11*	*0.29*	*0.15*	*0.23*	*0.48*
	N	19	19	16	19	19	19	19
Macro	mean	20.6	0.00	0.39	0.48	0.19	0.08	1.00
	std.dev.	*1.50*	*0.00*	*0.01*	*0.30*	*0.16*	*0.29*	*0.00*
	N	13	13	12	12	12	12	10
Micro	mean	19.5	0.00	0.40	0.27	0.02	0.07	0.65
	std.dev.	*1.05*	*0.00*	*0.01*	*0.25*	*0.28*	*0.26*	*0.49*
	N	20	20	17	17	15	15	20
Economics	mean	20.8	0.00	0.36	0.56	0.09	0.13	0.94
	std.dev.	*0.40*	*0.00*	*0.06*	*0.20*	*0.20*	*0.34*	*0.25*
	N	16	16	16	16	16	16	16
Total	mean	20.5	0.00	0.37	0.43	0.07	0.07	0.75
	std.dev.	*1.58*	*0.00*	*0.06*	*0.29*	*0.21*	*0.26*	*0.44*
	N	79	79	71	74	72	72	76

Men

Course		age (years)	gender (male=1)	absolute risk aversion (risk averse>0)	CBO (overconfident>0)	BTA (better than avg>0)	more accurate (yes=1)	know (want to know=1)
Chemistry	mean	18.8	1.00	0.36	0.41	0.06	0.24	0.44
	std.dev.	*1.11*	*0.00*	*0.08*	*0.22*	*0.21*	*0.43*	*0.50*
	N	47	47	45	45	45	45	43
Statistics	mean	21.9	1.00	0.32	0.54	0.07	0.40	0.41
	std.dev.	*0.86*	*0.00*	*0.11*	*0.20*	*0.22*	*0.50*	*0.50*
	N	46	46	46	46	45	45	46
Macro	mean	21.6	1.00	0.36	0.54	0.20	0.45	0.55
	std.dev.	*3.04*	*0.00*	*0.09*	*0.20*	*0.20*	*0.51*	*0.51*
	N	23	23	21	21	19	20	22
Micro	mean	19.2	1.00	0.38	0.48	0.11	0.38	0.81
	std.dev.	*1.19*	*0.00*	*0.06*	*0.21*	*0.38*	*0.50*	*0.40*
	N	23	23	20	20	16	16	21
Economics	mean	21.1	1.00	0.32	0.50	0.19	0.50	0.97
	std.dev.	*0.96*	*0.00*	*0.09*	*0.22*	*0.17*	*0.50*	*0.18*
	N	63	63	63	63	62	62	58
Total	mean	20.6	1.00	0.34	0.49	0.12	0.40	0.65
	std.dev.	*1.87*	*0.00*	*0.09*	*0.22*	*0.22*	*0.49*	*0.48*
	N	202	202	195	195	187	188	190

Appendix 1.3: Extra-Questionnaire (measurement validation).

This information will be used only for research purposes and under total confidentiality (neither the professor nor the teacher assistant will have access to it).

Please try to answer as honestly as you can.

ID number (or name if you do not remember):________________________________

Age: __________ years

We would like to assess your general knowledge, and how well you know how much you know. For the following series of questions with clear-cut numerical answers, please provide 90% confidence intervals. Such an interval has a lower an upper bound such that you are 90% sure the correct answer lies in this interval. Note that if your intervals are too wide, the correct answer will fall in your interval more than 90% of the time, while, if you intervals are too narrow, the correct answer will fall in your intervals less than 90% of the time.

Question	Lower bound	Upper bound
GDP per capita in Malaysia in 2005 (in US dollar 2004)		
Number of countries in the United Nations		
Year in which Mozart wrote his first symphony		
Gestation (conception to birth) period of an Asian elephant (in days)		
Elevation (in meters above sea level) of Mt. Everest		
Number of babies born in world in 2007 (per 1000 people)		
World –wide life expectancy at birth in 2000-05 (years)		
Land area in the world (in millions of square kilometers)		
Greatest depth (in meters) of the Pacific Ocean		
Number of calories in 100gr. potato		

Do you think that your answers were more accurate than your colleagues in the Questionnaire you just answered? (Answer YES or NOT)

____

Of the 56 (yourself included) students in this class, how many do you think will end up having a higher score than you in the test you just performed?

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